

## **OPERATING INSTRUCTIONS**

Check the following fluid levels daily or prior to starting unit:

- Engine oil
- Compressor system oil (oil level should be visible within the sump mounted sight glass)
- Foam concentrate
- Onboard water supply

### **MULTIPLE USES**

The Pneumax modular compressed air foam unit can be operated in several pumping modes; water only, foam solution without compressed air, compressed air foam and compressed air only for support operations such as operating air tools, filling rescue air bags, etc. It is possible to pump foam solution from one discharge while pumping compressed air foam from another, or varying foam consistencies (expansion ratios) from different discharges simultaneously.

NOTE: Monitor engine and compressor instruments during and all operations.

### **WATER PUMPING OPERATIONS**

All unit operations begin with pumping water. These steps must be followed for operations involving pumping water, foam solution, compressed air or compressed air foam.

Connect the hose(s) to the desired discharge(s).

Prior to starting the engine, the Auto Sync controls should be in the AUTO/UNLOAD positions, which allows the air compressor to “free wheel” without pumping air.

If pumping water from an onboard booster tank, fully open the tank to pump valve. If pumping from an overboard source, the tank to pump valve should be fully closed.

## WATER PUMPING OPERATIONS (continued)

If so equipped. Turn on the main power switch to the CAFS unit.

To start the engine, open the Vernier throttle one to two counter-clockwise turns, move the ignition switch to the “ON” position, and push the start button to crank the engine, until it starts.

Throttle-up to desired pressure. If pump pressure is absent, it will be necessary to prime the pump utilizing the Pneumax Jet Primer. The Jet Primer utilizes compressed air from the onboard compressor system which is passed through a venturi, creating a vacuum within the water pump.

To prime, move the Auto Sync controls to the FIXED/RUN positions to build air pressure. Once air pressure has risen, move the Jet Primer air and vacuum valves to the open positions. The rush of air through the priming venturi will be audible. As water is drawn into the pump, some will be vented through the venturi and spill onto the ground. When the water discharge pressure gauge rises, the pump is primed.

After prime is achieved, close the Jet Primer air and vacuum valves. For water only operations, move the Auto Sync controls back to the AUTO/UNLOAD positions.

Open desired discharge valves and throttle-up to desired pressure.

## **FOAM SOLUTION OPERATIONS**

Follow the instructions above for water pumping operations. Turn on the foam proportioner to inject foam concentrate into the water stream. Refer to the foam proportioner operation manual for instructions in the proper operation of the installed proportioning system.

## **COMPRESSED AIR FOAM OPERATIONS**

Follow the instructions above for foam solution operations. Safe operations dictate the presence of foam concentrate in the water stream prior to the injection of compressed air. If foam concentrate is not present, a condition known as “slug Flow” will occur, where unmixed water and air is discharged through a nozzle in an erratic manner.

Discharge pressures for compressed air foam operations typically range between 90 and 130 PSI in a flow rate. Set water discharge pressure at the desired level

NOTE: Compressed air foam does not have the hydraulic characteristics of plain water or foam solution. Therefore, standard pump hydraulics practices do not apply to CAFS operations.

## COMPRESSED AIR FOAM OPERATIONS (continued)

Move Auto Sync controls to the AUTO/RUN positions. Air pressure as shown on the air pressure gauge should rise to within plus or minus 5% of the water discharge pressure. The Auto Sync system will balance the air and water pressures throughout a range of 40 PSI up to 150 PSI.

Set proportioner at 0.3% - .06% for normal Class A combustibles. Proportioning rates are dictated by the type and brand of foam concentrate used and the tactical objective.

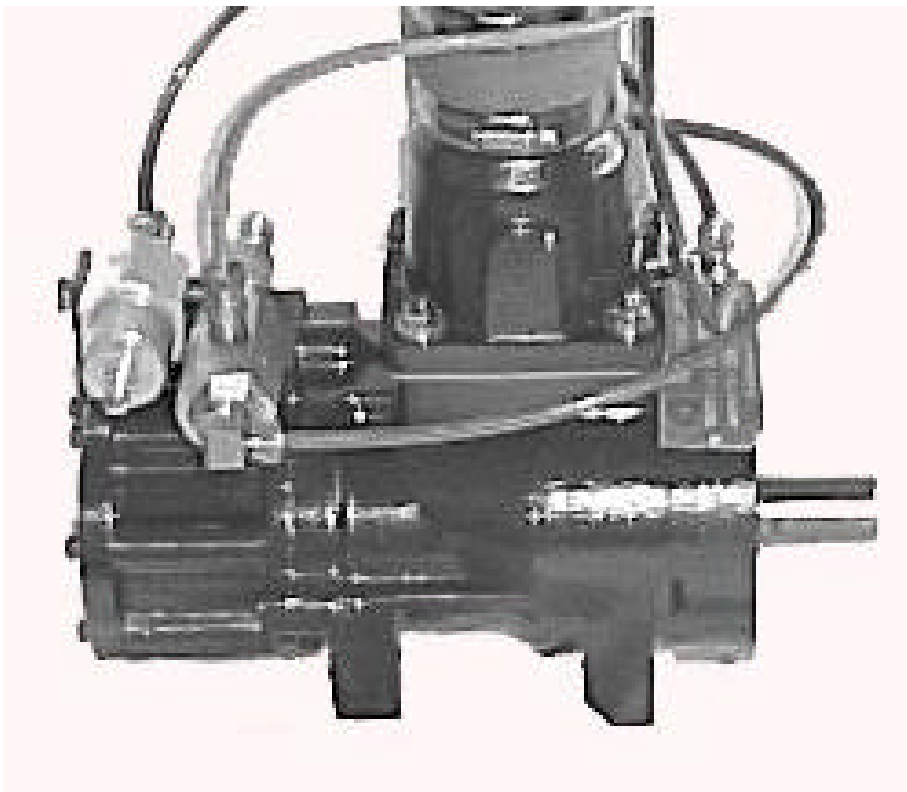
Open desired discharge valve(s) by pulling the “TEE” handle approximately 1-1/2” from the closed position. The foam expansion ratio is set by controlling the amount of foam solution entering the discharge stream. High solution flows restrict the amount of air admitted and result in lower expansion or “wet” foam. To produce higher expansion or “drier” foam, simply gate the discharge back to reduce the amount of solution admitted.

Fully open the air valve(s) to the desired discharge(s).

Foam is formed during the transition through the hose. To produce acceptable finished foam; sufficient hose length must be provided on the discharge. Refer to Table 1 for minimum hose lengths for CAFS operations.

**WARNING:** Nozzle reaction force is significantly increased at the time the nozzle valve is opened in compressed air foam operations. OPEN CAFS NOZZLES SLOWLY!

**Operation and Maintenance  
Pneumax/Rand CE55  
Rotary Screw  
Water Cooled Air Compressor**



The air compressor used in this application is an oil flooded rotary screw type. Rotary screw compressors of this type are very common in industry. This type of compressor injects oil into itself. The oil is entrained in the air discharge from the compressor. The oil lubricates, seals, cools, and silences the compressor. The air/oil mixture is discharged into a sump tank where most of the oil separates from the air. The oil is sent via hydraulic hose to combination cooler-thermostat-filter unit. It is cooled to remove the heat of compression and friction heat, filtered, then sent to the oil injection port on the compressor. The cycle is then repeated.

The oil mist that remains in the airstream is recovered by an air/oil separator system. This system recovers the oil mist in a cartridge. The cartridge has a siphon tube to pick up the liquid and return it to the system through a port on the compressor.

The compressor's output is controlled by a modulating inlet valve. The inlet valve is opened and closed by a pressure sensing system.

A water system circulates water from the fire pump through the oil cooler and back to tank to cool the compressor. The compressor's oil thermostat is set at 175 degrees. The compressor's temperature should not exceed 220 degrees. If so, check for restrictions in the cooling water system or for low oil level in the reservoir.

The compressor and pump are always engaged.

Drawings and illustrations of the various components are included in the following pages.

1. CE55 Air End, showing ports
2. 320448CE.1 Oil schematic, with connection labels
3. Oil cooler/ thermostat/filter , with part numbers as assigned
4. 320550 Inlet valve, with part numbers as assigned
5. Reservoir/Separator, with part numbers as assigned
6. 320444D Auto Sync schematic, illustrated
7. 320443.1 Basic CAF Schematic

## SERVICE AND MAINTENANCE

1. There is a sight gauge on the oil reservoir, visible The oil level should be at ½ of the window. Check the oil on level ground, prior to system start up. If the system has been run wait 10 minutes for the oil to stabilize before trying to determine the level. The compressor uses hydraulic oil. The oil is classified by an ISO standard. An ISO 68 viscosity oil should be used. There are various trade names for such an oil. Many are sold as a “anti-wear” oil, and the manufacturer will call it AW-68. The oil is available at most oil distributors and through NAPA.
2. The oil should be changed after the first 30 hours of system operation. After that the oil should be changed yearly. There is a drain cap available at the bottom of the reservoir.
3. Change the oil filter at the same time as the oil is changed. The spin-on filter cartridge is a Donaldson hydraulic filter. The filter will interchange to several other common brands.
4. Inspect the air filter and clean as needed. The environment that the unit operates in will determine the frequency of air filter services.
5. Run the compressor for 2 minutes after changing the oil, then re-check the oil level.
6. Visually inspect the system periodically for signs of leaks. Check the flexible coupling for signs of excess wear.
7. Replace the oil / air separator cartridge every 24 months, or if the oil consumption of the unit suddenly increases. The increase will be caused by a hole or tear in the separator media allowing oil to carry through.
8. Completely drain the water from the compressor oil cooler in cold weather to prevent freeze damage.
9. . Maintenance Schedule:

	Check Oil Level & for Oil Leaks	Change compressor oil	Change Oil Filter	Change Separator Cartridge
Daily or after each use	X			
Annually		X	X	
Every 24 Months				X

## SYSTEM FILTERS

Compressor Hydraulic Filter= WD- 920  
Compressor Separator Filter= LB 962/2  
Compressor Air Filter= ECC085005

## **CAFS NOZZLE / FLOW RATE / HOSE COMBINATIONS**

### **NOZZLES**

Compressed air foam can be discharged through various types and sizes of nozzles. Fog nozzles breakdown the bubble structure of the foam, resulting in "wetter" or reduced expansion foam. Similarly, when utilizing smooth bore nozzles with a given hose diameter, smaller tips will discharge "wetter" foam.

### **FOAM CONCENTRATE RATIOS**

Proportioner settings of 0.2% and 0.3% are typically adequate to produce compressed air foam that is formed in a hoseline and used on Class A combustibles. Higher settings will result in a "drier" appearing foam. Lower settings may result in "slug flow" or discharge pulsation cause by insufficient foam concentrate in solution to form foam in the hoseline. For Class B or other type foam ratio settings, follow the instructions provided by the foam concentrate manufacturer.

### **HOSE**

Utilize fire hose that is rated by the hose manufacturer for use with CAFS. Since the foam is formed during its transition through the hoseline, it is important to utilize the minimum recommended hose lengths, unless a static mixer is utilized. There is significantly less friction and head loss with compressed air foam as compared to water or foam solution. Hence, effective fire streams can be achieved with longer hose lays. Refer to the Suggested Guidelines for the Production of Mid-Range Compressed Air Foam.

### **NOTE**

Compressed air foam systems have the ability to produce a foam of shaving cream consistency. While this type of foam is highly stable and possesses a long drain time, it is essential to ensure that the foam will release sufficient water to extinguish a fire in a direct attack situation. This type of foam is typically suited for defensive operations such as exposure protection, barriers or fuels pretreatment.

## **SUGGESTED GUIDELINES FOR THE PRODUCTION OF MID-RANGE COMPRESSED AIR FOAM**

### **1" HOSE DIAMETER**

1 GPM to 1 CFM  
1/2" Tip Water Flow: 15 GPM Air Flow: 15 CFM  
Disch. Pressure: 125-150 PSI  
Min/Max Hose Length: 35' to over 400'

2 GPM to 1 CFM  
½" Tip Solution Flow: 30 GPM Air Flow 15 CFM  
Disch Pressure 100-150 PSI  
Min/Max Hose Length: 35' to over 400'

1 GPM to 1 CFM  
3/4" Tip Water Flow: 20 GPM Air Flow: 20 CFM  
Disch. Pressure: 125-150 PSI  
Min/Max Hose Length: 35' to over 200'

2 GPM to 1 CFM  
¾" Tip Water Flow: 40 GPM Air Flow 20 CFM  
Disch Pressure: 100-150 PSI  
Min/Max Hose Length: 35' to over 200'

### **1-1/2" HOSE DIAMETER**

1 GPM to 1 CFM  
1" Tip Water Flow: 30-40 GPM Air Flow: 30-40 CFM  
Disch. Pressure: 110-150 PSI  
Min/Max Hose Length: 100' to over 800'

2 GPM to 1 CFM  
1" Tip Water Flow: 60-80 GPM Air Flow 30-40 CFM  
Disch Pressure: 100-150 PSI  
Min/Max Hose Length: 100' to over 800'

1 GPM to 1 CFM  
1-3/8" Tip Water Flow: 50-60 GPM Air Flow: 50-60 CFM  
Disch. Pressure: 110-150 PSI  
Min/Max Hose Length: 100' to over 400'

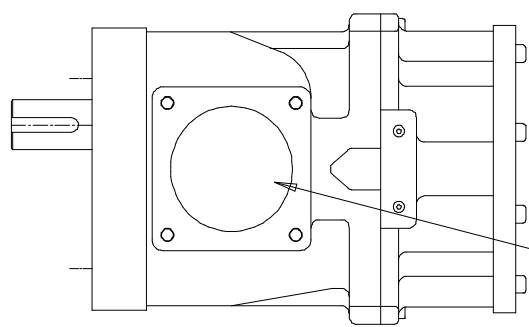
2 GPM to 1 CFM

1-3/8" Tip Solution Flow: 90-120 GPM Air Flow: 50-60 CFM

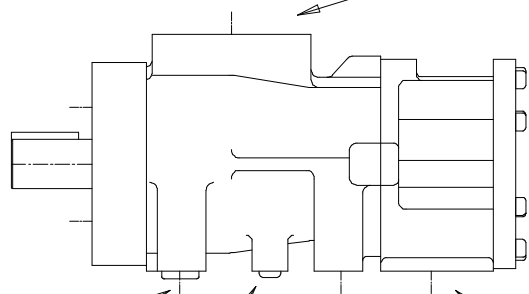
Disch Pressure: 100-150 PSI

Min/Max Hose Lengths 100' to over 800'





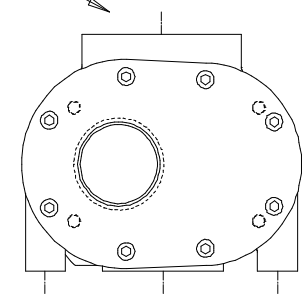
Air Inlet Port



Oil Injection Port  
#6 JIC Male

Oil Scavenge  
#4 JIC Male

Main Compressor Discharge  
#20 JIC Male

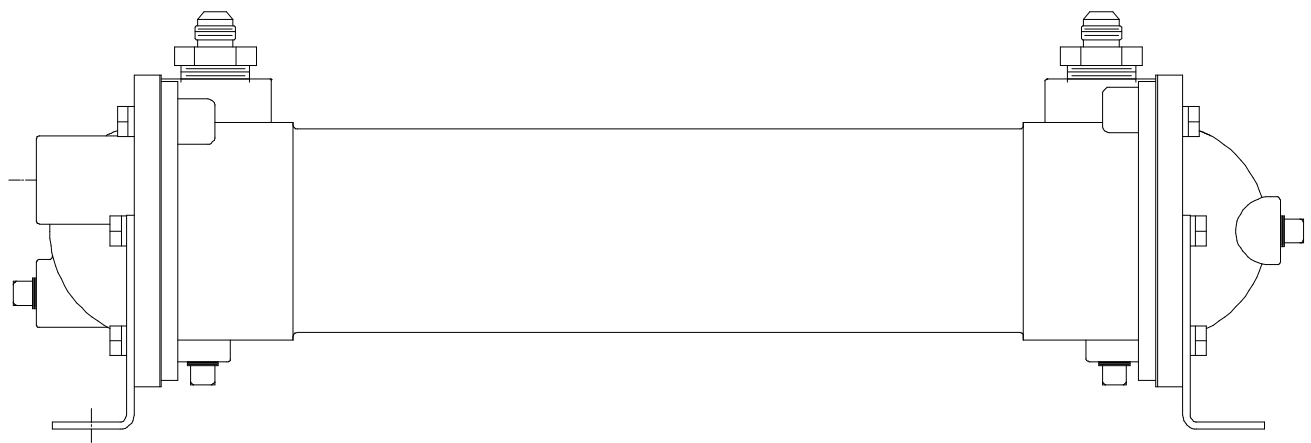


-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
A	CAG	03/07/97
REV.	BY	DATE

NOTES:  
 1. DO NOT SCALE DRAWING.  
 2. NO BURRS PERMISSABLE  
 3. DECIMAL TOLERANCE +/- .063  
 4. ANGLE TOLERANCE +/- .500

This print is the property of Pneumax, Inc. and is loaned to you subject to return on demand unless otherwise agreed to in writing by Pneumax, Inc.. Its contents are confidential and must not be copied or submitted to third parties for user examination.

6051 North 56th Avenue Suite 2 Glendale, Az 85301 (602) 842-2111			
<h1>Pneumax, Inc.</h1> <h2>CE-55 RAND AIR END</h2>			
SIZE A	FSCM NO.	DWG NO.	REV A
SCALE ---	SHEET 1 of 1		

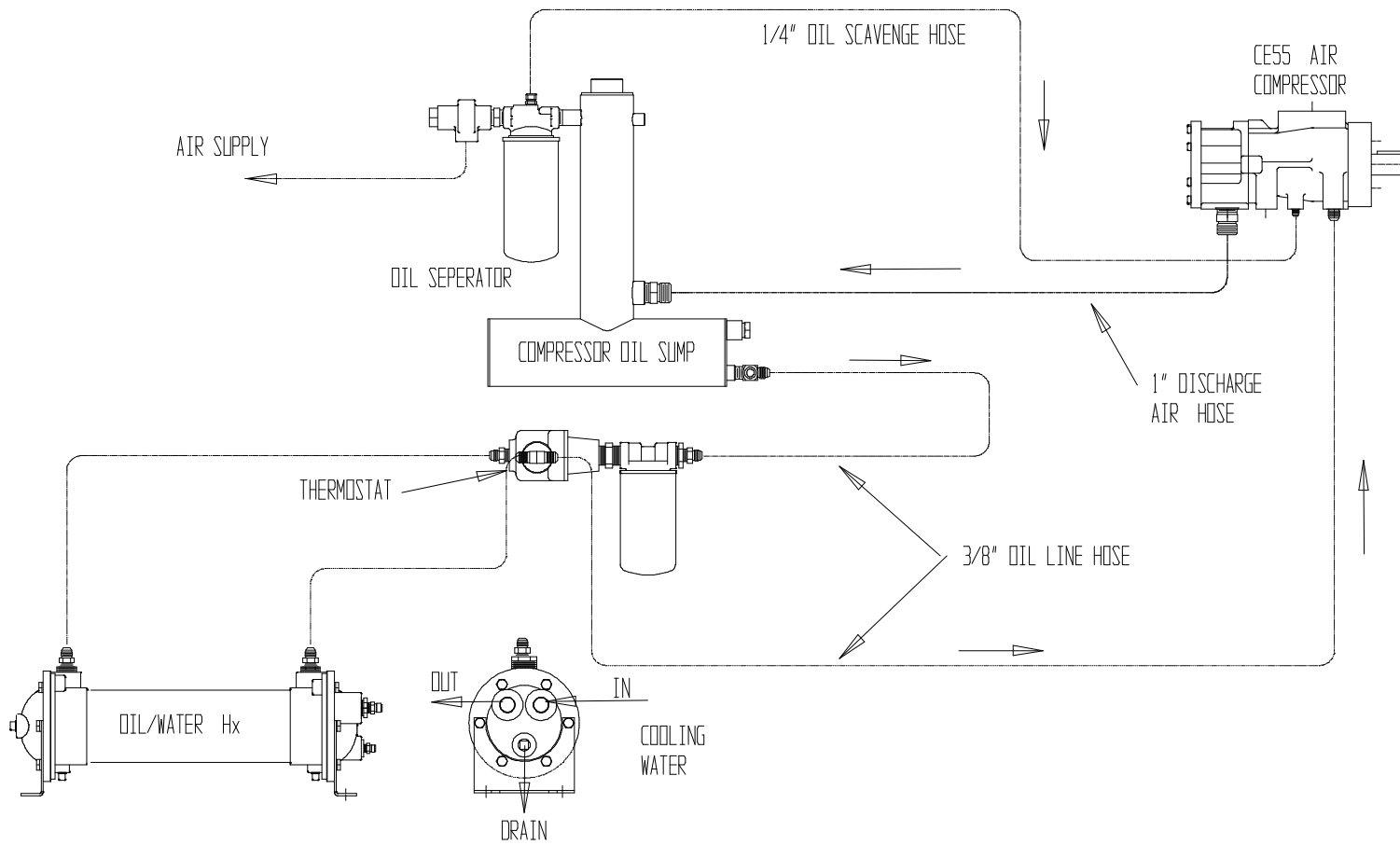


-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
REV.	BY	DATE

NOTES:  
 1. DO NOT SCALE DRAWING.  
 2. NO BURRS PERMISSABLE  
 3. DECIMAL TOLERANCE +/- .063  
 4. ANGLE TOLERANCE +/- .500

This print is the property of Pneumax, Inc. and is loaned to you subject to return on demand unless otherwise agreed to in writing by Pneumax, Inc.. Its contents are confidential and must not be copied or submitted to third parties for use or examination.

<i>Pneumax, Inc.</i> 6051 North 58th Avenue Suite 2 Glendale, Az 85301 (602) 842-2111			
			----- -----
SIZE A	FSCM NO.	DWG NO. <b>320448d</b>	REV A
SCALE ---		SHEET 1 of 1	



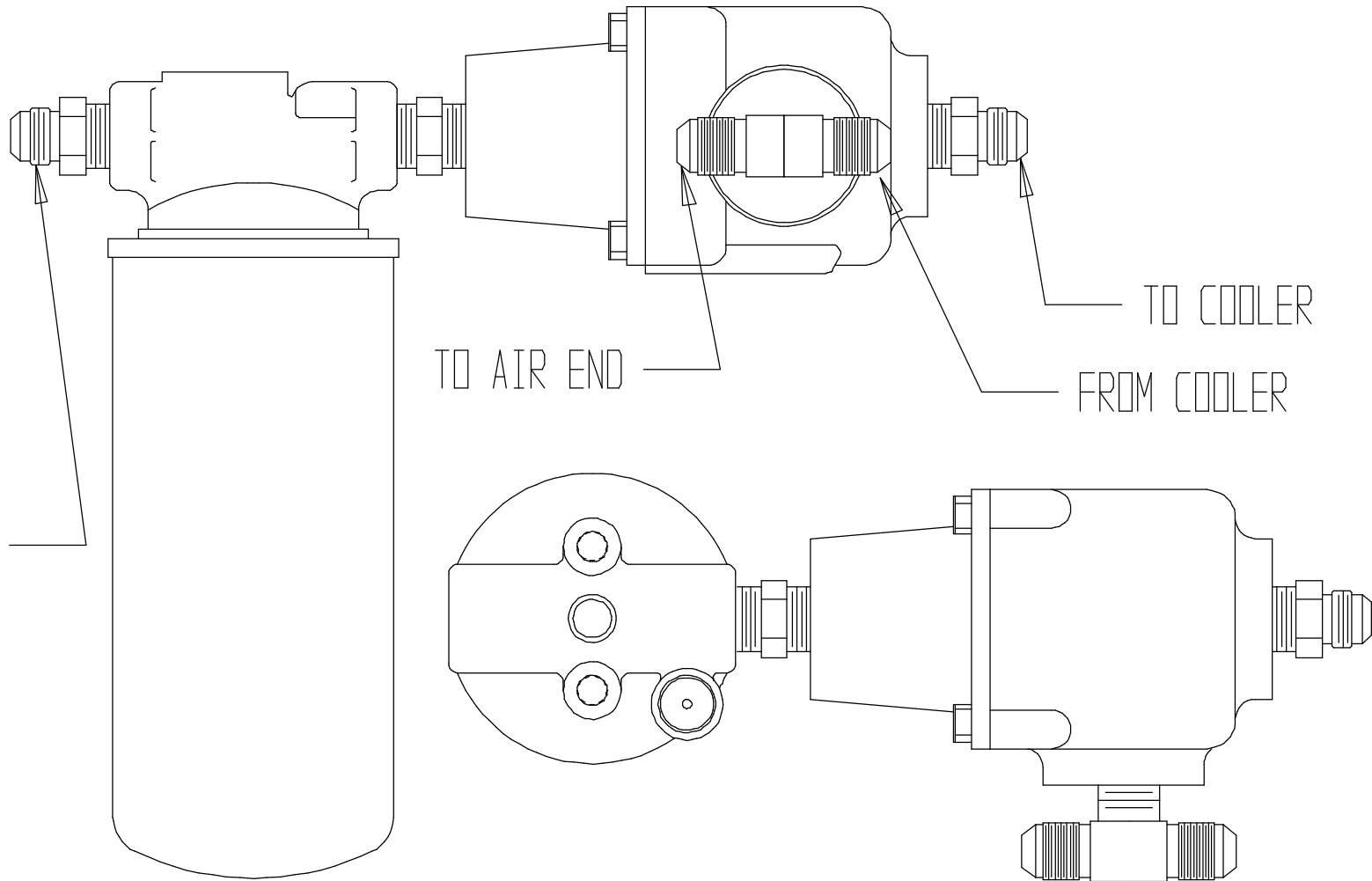
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
ORIG	DMW	01/27/99
REV.	BY	DATE

NOTES:  
 1. DO NOT SCALE DRAWING.  
 2. NO BURRS PERMISSABLE  
 3. DECIMAL TOLERANCE +/- .063  
 4. ANGLE TOLERANCE +/- .500

This print is the property of Pneumax, Inc. and is loaned to you subject to return on demand unless otherwise agreed to in writing by Pneumax, Inc.. Its contents are confidential and must not be copied or submitted to third parties for user examination.

<b>Pneumax, Inc.</b> 8557 North 78th Avenue Peoria, Az 85345 (602) 979-3398			
			<b>HYDRAULIC SCHEMATIC</b> <b>RAND CE55 / 100-50</b>
SIZE A	FSCM NO.	DWG NO. <b>314002</b>	REV --
SCALE ---	SHEET <b>1</b> of <b>1</b>		

FROM  
SLUMP

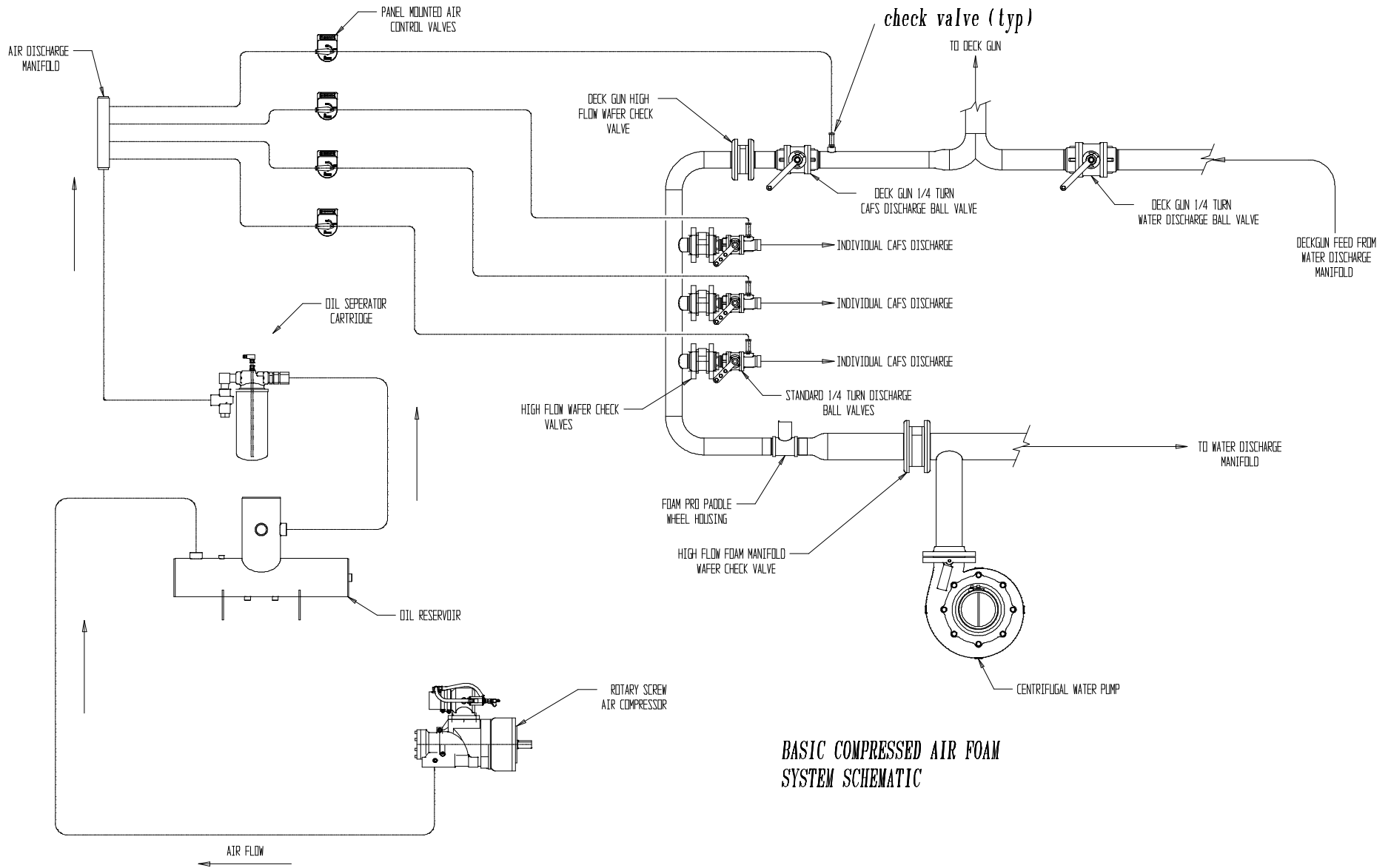


-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
B	DMW	06/09/99
A	CAG	--/--/--
REV.	BY	DATE

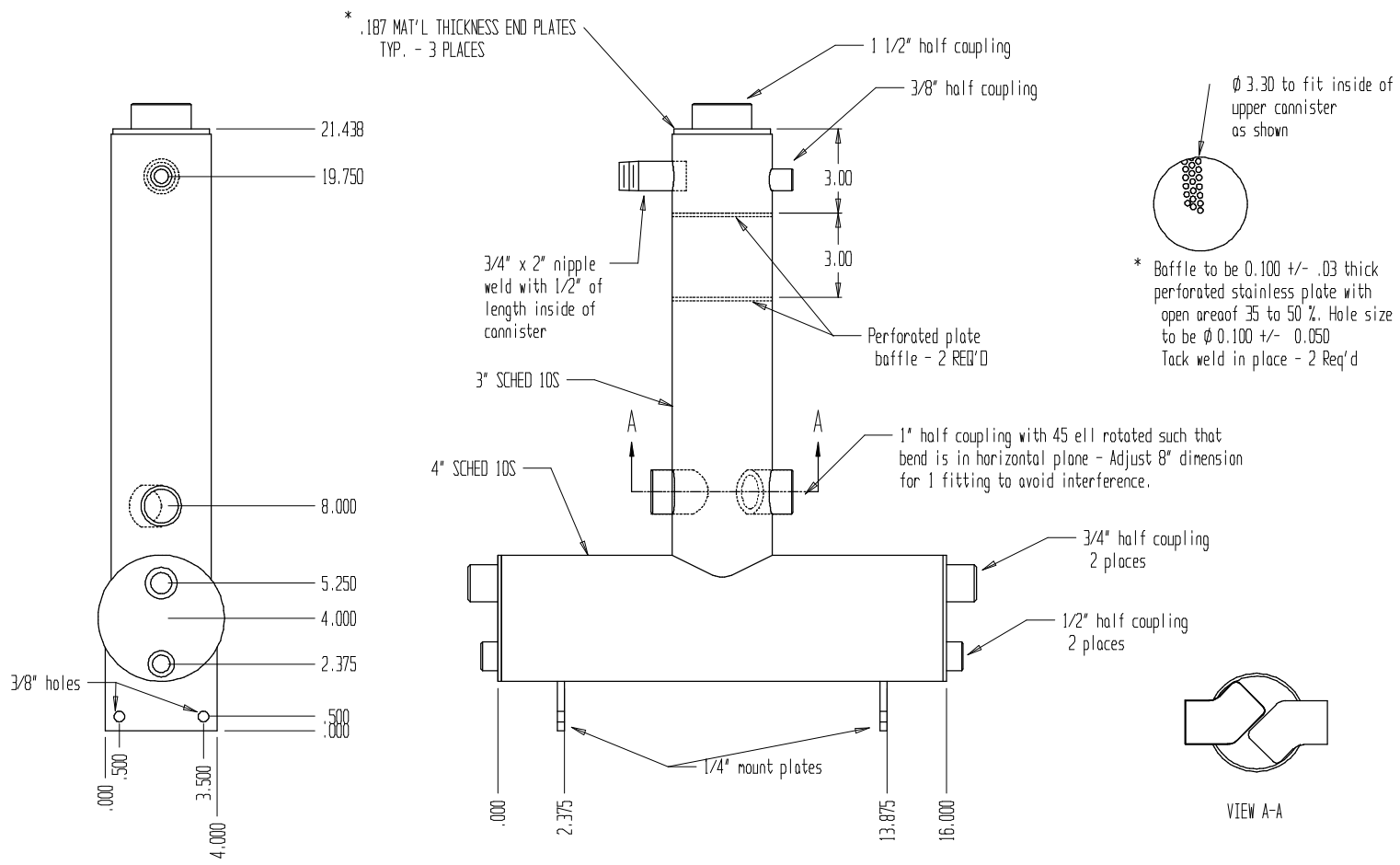
NOTES:  
 1. DO NOT SCALE DRAWING.  
 2. NO BURRS PERMISSABLE.  
 3. DECIMAL TOLERANCE +/- .063  
 4. ANGLE TOLERANCE +/- .500

This print is the property of Pneumax, Inc. and is loaned to you subject to return on demand unless otherwise agreed to in writing by Pneumax, Inc.. Its contents are confidential and must not be copied or submitted to third parties for more examination.

<b>Pneumax, Inc.</b> 6051 North 50th Avenue Suite 2 Glendale, Az 85301 (602) 642-2111			
			<b>Thermostat and Oil Filter          GHH Rand Air Compressor</b>
SIZE A	FSCM NO.	DWG NO. 320444b1	REV B
SCALE ---	SHEET		1 of 1



**BASIC COMPRESSED AIR FOAM SYSTEM SCHEMATIC**



1. ALL MATERIAL TO BE TYPE 304L STAINLESS STEEL.
2. PIPE FITTINGS TO BE SCHED 40S
3. BAFFLES TO BE TACK WELDED IN PLACE, RANDOM ORIENTATION.
4. RESERVOIR TO BE LEAK FREE TO 500 PSI.

-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
* A	DMW	04/14/99
ORIG	DMW	03/27/98
REV.	BY	DATE

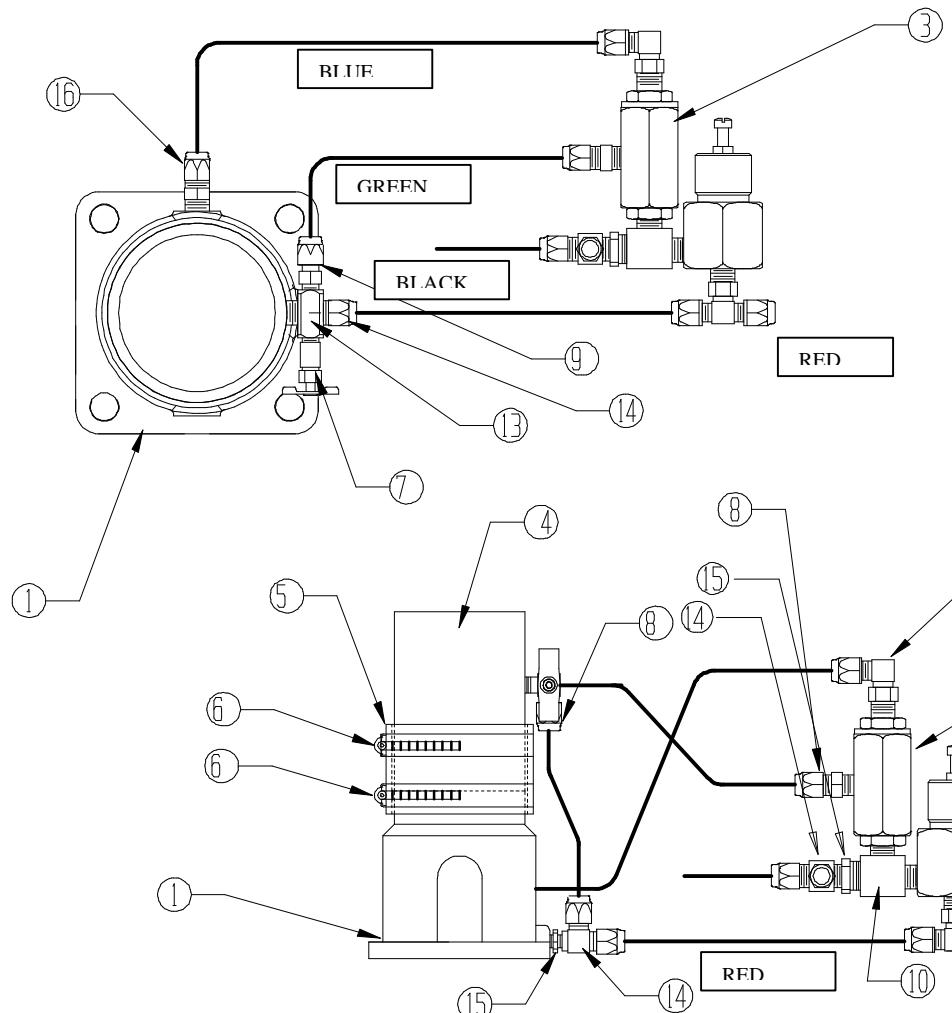
NOTES:  
 1. DO NOT SCALE DRAWING.  
 2. NO BURRS PERMISSABLE  
 3. DECIMAL TOLERANCE +/- .063  
 4. ANGLE TOLERANCE +/- .500

This print is the property of Pneumax, Inc. and is loaned to you subject to return on demand unless otherwise agreed to in writing by Pneumax, Inc.. Its contents are confidential and must not be copied or submitted to third parties for use or examination.

**Pneumax, Inc.** 8567 North 78th Avenue  
 Peoria, Az 85345  
 (623) 979 - 3398

**STAINLESS SUMP UNIT CE-55 RAND**  
**90 / 45 PHOENIX**

SIZE A	FSEM NO.	DWG NO. 325001A	REV A
SCALE ---	SHEET 1 of 1		



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	-----	AIR-CON 1 3/4" AIR INLET
2	1	-----	AIR-CON PRESSURE CONTROL
3	1	-----	AIR-CON BLOWDOWN
4	1	-----	2.5" OD ALUM. TB 1/4" WALL 4" LNG
5	1	-----	2.5" ID RUBBER HOSE 2" LNG
6	2	-----	2.5" WORM CLAMP
7	1	-----	A555 NEEDLE VLV. COMP STR/WAY.
8	1	-----	1484 X 4 INSERT 1/4"
9	1	-----	1468X4M/MOD-1/16HOLE FOR BD VLV
10	1	-----	TF3805X4F RUN TEE 1/4"
11	2	-----	1468X4X4M CONN 1/4" ABX 1/4" PIPE
12	1	-----	1469X4X4M 90 EL. 1/4" ABX 1/4" PIPE
13	1	-----	3600X2M BRANCH TEE 1/8"
14	2	-----	1471X4M RUN TEE 1/4" ABX 1/8" PIPE
15	3	-----	3220X4X2 BUSHING 1/4" 1/8" PIPE
16	1	-----	1468X4 MALE CONNECTOR
17	1	-----	1472 x 4 BR. tee

REV.	BY	DATE
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
-	---	--/--/--
B	MCS	08/15/97
A	CAG	02/27/97

NOTES:  
 1. DO NOT SCALE DRAWING.  
 2. NO BURRS PERMISSABLE  
 3. DECIMAL TOLERANCE +/- .063  
 4. ANGLE TOLERANCE +/- .500

This print is the property of Pneumax, Inc. and is loaned to you subject to return on demand unless otherwise agreed to in writing by Pneumax, Inc.. Its contents are confidential and must not be copied or submitted to third parties for user examination.

8051 North 58th Avenue  
 Suite 2  
 Glendale, Az 85301  
 (802) 842-2111

**P**

## Pneumax, Inc.

### 1 3/4 AIRCON INLET VALVE TUBING BUILD-UP CE55 RAND AIR END

SIZE A	FSCM NO.	DWG NO. 320550	REV A
SCALE ---	SHEET 1 of 1		

## CONDITIONAL **2-YEAR** WARRANTY POLICY

PNEUMAX warrants, to the original Buyer only, that products and parts manufactured by PNEUMAX will be free from defects in material and workmanship under normal use and service for a period of two (2) years from the date the product is first placed in service, or two and one-half (2-1/2) years from the date of shipment by PNEUMAX, whichever period shall be the first to expire; provided the Buyer notifies PNEUMAX, in writing, of the defect in said product within the warranty period, and said product is found by PNEUMAX to be nonconforming with the aforesaid warranty. When required in writing by PNEUMAX, defective products must be promptly returned by Buyer to PNEUMAX at PNEUMAX' plant at Peoria, Arizona, or at such other place as may be specified by PNEUMAX, with transportation and other charges prepaid. A **Returned Material Authorization (RMA)** is required for all products and parts and may be requested by phone, fax or mail. The aforesaid warranty excludes any responsibility or liability of PNEUMAX for:

- (a) damages or defects due to accident, abuse, misuse, abnormal operating conditions, negligence, accidental causes, or improper maintenance, or attributable to written specifications or instructions furnished by Buyer;
- (b) defects in products manufactured by others and furnished by PNEUMAX hereunder, it being understood and agreed by the parties that the only warranty provided for such products shall be the warranty provided by the manufacturer thereof which, if assignable, PNEUMAX will assign to Buyer, if requested by Buyer;
- (c) any product or part, altered, modified, serviced or repaired other than by PNEUMAX, without its prior written consent; and
- (d) the cost of dismantling, removing, transporting, storing, or insuring the defective product or part and the cost of reinstallation.
- (e) normal wear items (including, but not limited to belts, hoses, check valves, packing, strainers, filters, light bulbs, anodes, intake screens, mechanical seals, etc.).

This warranty is subject to PNEUMAX' Conditions of Sale (detailed on PNEUMAX Invoice) as currently in effect all of which are herein incorporated and by this reference made a part hereof.

**All other warranties are excluded, whether express or implied by operation of law or otherwise, including all implied warranties of merchantability or fitness for purpose. PNEUMAX shall not be liable for consequential or incidental damages directly or indirectly arising or resulting from the breach of any of the terms of this limited warranty or from the sale, handling, or used of any PNEUMAX product or part. PNEUMAX' liability hereunder, either for breach of warranty or for negligence, is expressly limited at PNEUMAX' option:**

- (A) to the replacement at the agreed point of delivery of any product or part, which upon inspection by PNEUMAX or its duly authorized representative, is found not to conform to the limited warranty set forth above, or
- (B) to the repair of such product or part, or
- (C) to the refund or crediting to buyer of the net sales price of the defective product or part.

**Buyer's remedies contained herein are exclusive of any other remedy otherwise available to Buyer.**

**Pneumax, Inc.**  
**8557 N 78<sup>th</sup> Ave**  
**Peoria, AZ 85345**  
**[www.pneumaxcafs.com](http://www.pneumaxcafs.com)**

